

IDS Report: Chuck Dermer
GLAST
1 Oct 2004

1. Committees
 - VERITAS External Oversight Committee (ESAC)
 - INTEGRAL Time Allocation Committee
 - NASA Structure and Evolution of the Universe Advisory Committee
2. Colloquia
3. Programmatics
4. Science

GLAST-related Publications

Recent papers

1. GeV-TeV synchrotron radiation from hyper-relativistic electrons (Dermer and Atoyan, A&A Letters, 2004)
2. Neutral Beam Formation (Atoyan and Dermer, ApJ, 2003, 2004, ApJ Letters 2004)
 - X-ray knots and hot spots observed with Chandra
 - Solves collimation and bulk Compton radiation problems
 - Neutrino production
3. GRB Jets and the Curvature Relation (CD ApJ 20004)
4. High Energy Cosmic Rays from GRBs (Wick, CD, Atoyan, Asrotpar Ph. 20004): Complete Solution to the Origin of the Cosmic Rays
5. Cosmic Rays from GRBs in the Galaxy (Holmes and CD, in preparation, 20004)

Gamma Rays from Relativistic Jets

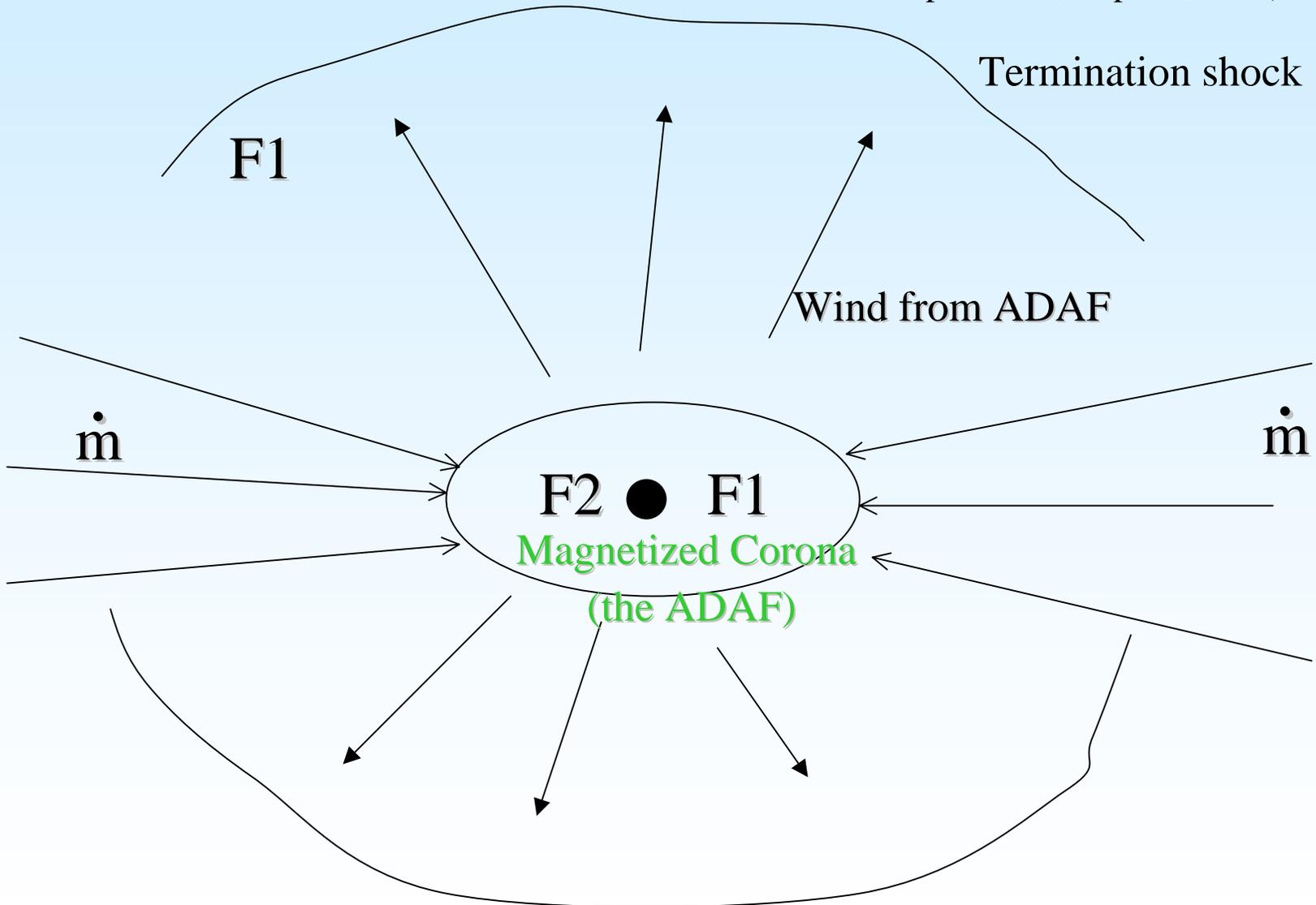
Predictions for GLAST

1. Signatures of Hadrons in GRBs
 - Prompt hadronic cascade emission components
 - Delayed hyper-relativistic synchrotron emission from ultra-relativistic electrons formed as neutron secondaries
2. Hadronic γ -ray emission in Blazar Spectra
 - Correlated with Neutrino Production
 - Testable with Joint GLAST/IceCube Neutrino Telescope Observations
3. High Energy Cosmic Rays from GRBs
 - Neutron-decay X-ray/ γ -ray synchrotron halos around star-forming and GRB-active galaxies
 - Neutrinos from GRBs

TeV Radiation from the Galactic Center Black-Hole Plerion

New work to interpret HESS results on TeV
Emission from the Galactic Center

(Atoyan and Dermer,
ApJ Letters, in press, 2004)



New Concept: the Black Hole Plerion

Particle escape by convective outflow in advection-dominated inflow-outflow source (ADIOS) extension (Blandford & Begelman 1999) of ADAF model.

Assume a wind power

$$L_{wind} = 10^{37} L_{37} \text{ ergs s}^{-1}$$

With speed $v_{wind} \approx c/2$ directed into solid angle $\Omega \approx 1 \text{ sr}$

Wind terminates at a subrelativistic shock at

$$R_{shock} \cong 3 \times 10^{16} L_{37}^{1/2} \Omega_w^{-1/2} \text{ cm}$$

found by equating thermal gas pressure with energy density of wind

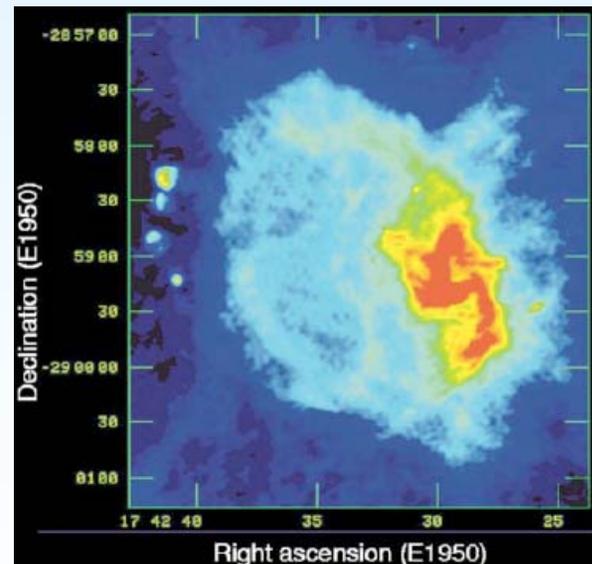
6 cm VLA radio of **Sgr A East** and
Sgr A West

(Yusef-Zadeh, Melia, & Wandle 2000.)

Electrons and protons accelerated by first-order (shock) Fermi acceleration.

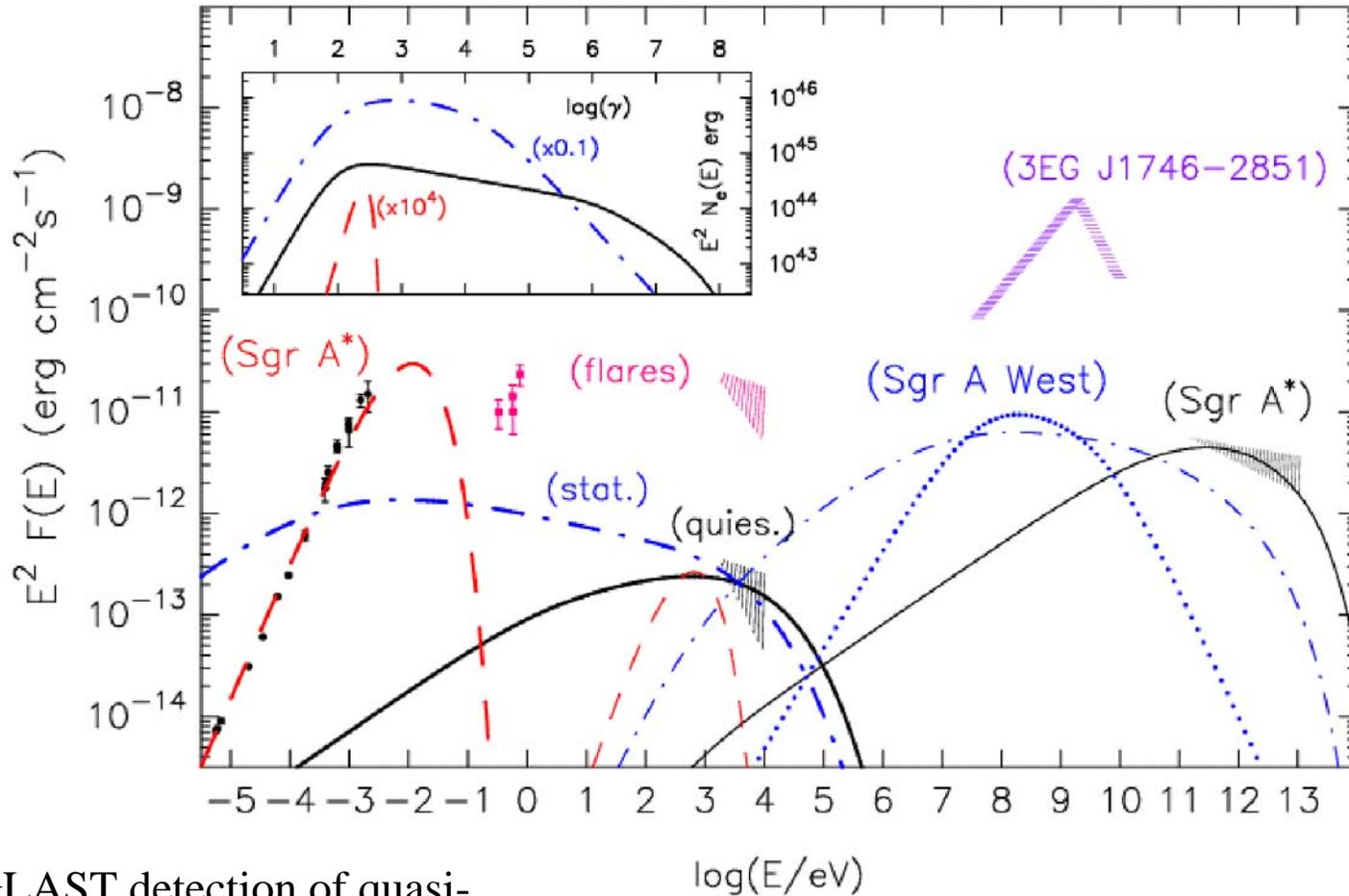
Electrons emit X-ray synchrotron radiation to form quiescent X-ray emission and Compton scatter

- ADAF emission
- 10^{13} Hz emission from cold dust ring around Sgr A*
- Wind from the Plerion powers Sgr A West



Inner Sagittarius region (4' x 3')

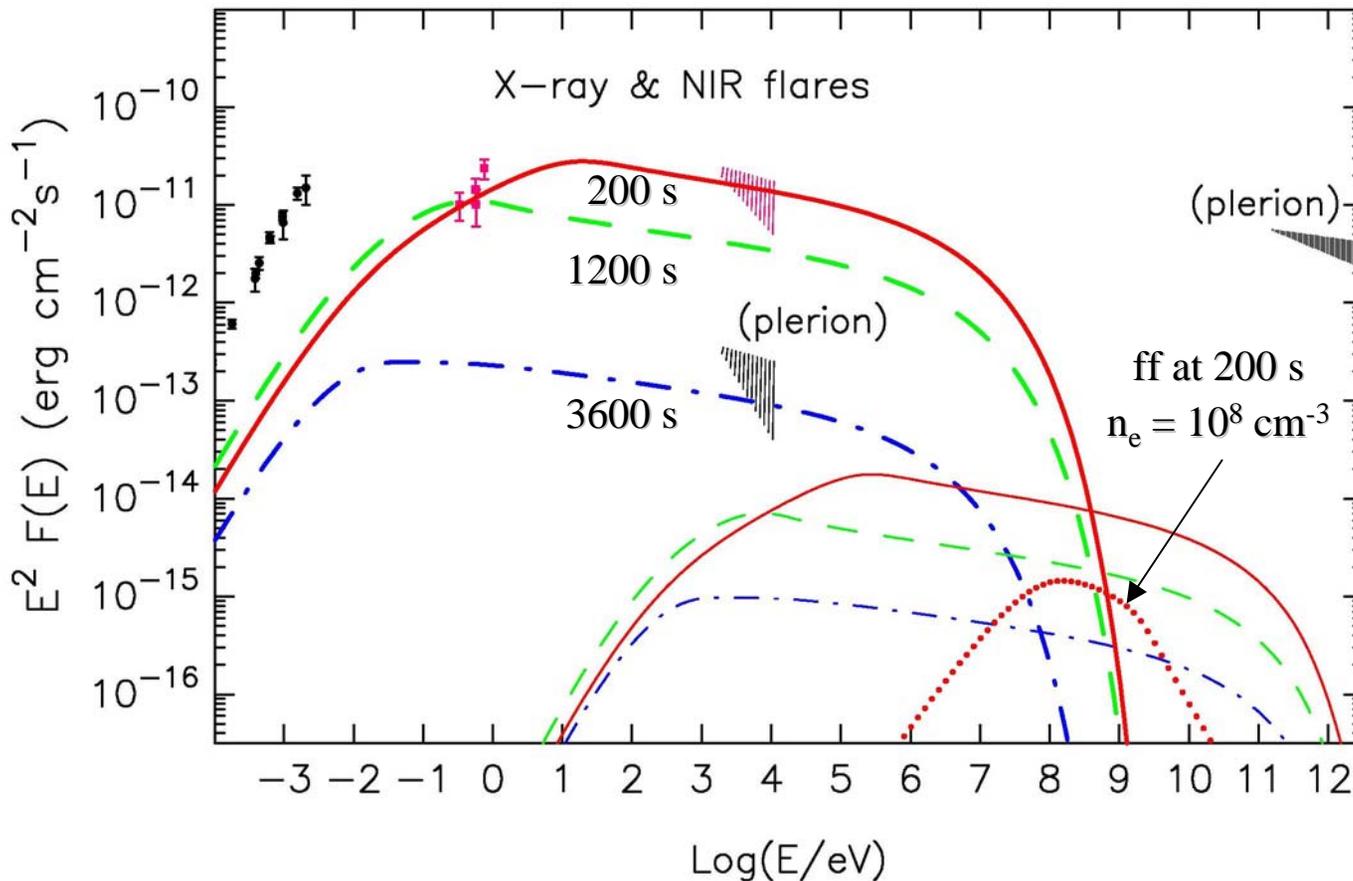
Galactic Center Black Hole Emission: Sgr A* ADAF + Black-Hole Plerion + Sgr A West, a black-hole remnant



Predict GLAST detection of quasi-stationary Compton and bremsstrahlung fluxes from pc-scale plerion.

Propagation of GeV electrons power Sgr A West
EGRET emission from young pulsar

Flaring Emissions from Inner Region



Flares from instabilities in accretion flow that form shocks at few r_s

First-order Fermi shock acceleration injects electrons with $\gamma < 10^6$, -2.2 injection index

Explains X-ray/NIR flares and short variability timescales from cooling and expansion

Self-absorbed flares at $< 100 \text{ GHz}$ from same electrons in "expanding source" scenario

Plans for Next Six Months

1. Presentations on GLAST-related Science
 - U. Kansas (November 2004)
 - NRAO Charlottesville (January 2004)
 - AAS San Diego (January 2004)
 - KITP Institute (May 2005)
2. Assist Julie McEnery in updating GLAST brochure
3. Gamma-ray Astronomy in the SEUS/Universe Roadmap